DALI-2 CS THP-AQ

Datasheet

Combi Sensor Modul

DALI-2 sensor module for measurement of:

motion
light intensity
temperature (T)
relative humidity (H)
air pressure (P)
air quality (AQ)

Art. Nr. 86457786-AQ-W16

Detection range variants: -O
Installation type variants: -ZD,-AP,-LE

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DALI-2 Combi Sensor THP AQ Multifunctional Sensor Modul

Overview

- Sensor module for DALI and DALI-2 light control systems
- sensor module for measuring movement, light intensity, temperature (**T**), relative humidity (**H**), air pressure (**P**) and air quality (**AQ**)
- 4 operating modes:
  - Movement triggered
  - Movement triggered with constant light control
  - Constant light control
  - Light control (4 thresholds)
- Additional threshold control for each of the sensor values: temperature (**T**), relative humidity (**H**), air pressure (**P**) and air quality (**AQ**)
- Operating modes can be changed via scenes and external DALI commands
- Corridor function – second light level before off in case of absence
- Light threshold-controlled regulation for the control of blinds or roller blinds
- The module can be used as a DALI light controller or just as sensor unit for integration in building management systems
- Easy configuration via DALI-Cockpit Software Tool and Lunatone DALI USB interface.
- Multiple sensor modules can be installed within a DALI system.
- Configurable synchronisation of multiple DALI-2 CS modules to control the same effective range
- Supply via the DALI bus, no additional power supply needed
- Double terminals for easy installation
- Different colour variants: pure white (RAL9010), traffic white (RAL9016), and black.
- Optimized variants for different applications and detection areas (standard, office) available
- Version for integration in luminaires available Art. Nr. 86457786-AQ-LE
- Version DALI-2 CS THP-AQ Integration https://www.lunatone.com/en/product/dali-2-cs-integration-thp-aq/
- Version DALI-2 CS Application Controller: https://www.lunatone.com/en/product/dali-2-cs/
- Version DALI-2 CS Integration: https://www.lunatone.com/en/product/dali-2-cs-integration/

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Specification, Characteristics

type	**DALI-2 CS THP-AQ**	
application	standard	office
article number	86457786 86457786 -AQ	86457786 -O 86457786 -AQ-O

electrical data

supply	via DALI signal line (DALI-voltage according IEC62386)
marking terminals	DA, DA
typical current consumption DALI	5.5 mA
power consumption	<100mW
control	DALI-2

insulation data

impulse voltage category	II
pollution degree	2
rated insulation voltage	250V
rated impulse withstanding voltage	4kV
insulation DALI/housing	reinforced isolation
insulation test voltage	3000Vac

environmental conditions

storing and transportation temperature	-20°C … +70°C
operational ambient temperature	-20°C … +60°C
rel. humidity, none condensing	15% … 90%

technical data

Motion Detection (62386 -303)		
principle	PIR	PIR
detection range (at >8°C temperature difference)	12m	3m /2.3m
typical mounting height	8m	3m
detection zones	92	36 / 48
horizontal	±51°	±44°/±90°
vertical	±46°	±44°/±90°
min. temperature difference	>4°C	>4°C
details	Figure. 1, page 7	Figure. 2, page 8
light sensor (62386-304)	range: 0-2046lux (11bit), resolution: 1lux events: 0-2046lux(10bit), resolution: 2lux	
temperature sensor (62386-103)	range: -20°C ... 80°C, resolution: 0,1°C	
humidity sensor (62386-103)	range: 0% ... 100%, resolution: 0,1%	
Air pressure sensor (62386-103)	range: 600hPa ... 1100hPa, resolution: 1hPa	
air quality sensor (62386-103)	range: 0 ... 500, resolution: 1	

index	air quality
0 - 50	excellent
51- 100	good
101 - 150	lightly polluted
151 - 200	moderately polluted
201 – 250	heavily polluted
251 -350	severely polluted
> 351	extremely polluted

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eCO2 sensor (CO2 equivalent) (62386-103)	range: 0ppm ... 8000ppm, resolution: 10ppm

ppm		air quality
0 - 350		excellent
351- 700		good
701 - 1000		lightly polluted
1001 – 1500		moderately polluted
1501 -2500		heavily polluted
2501-5000		severely polluted
5001-8000		extremely polluted

general data

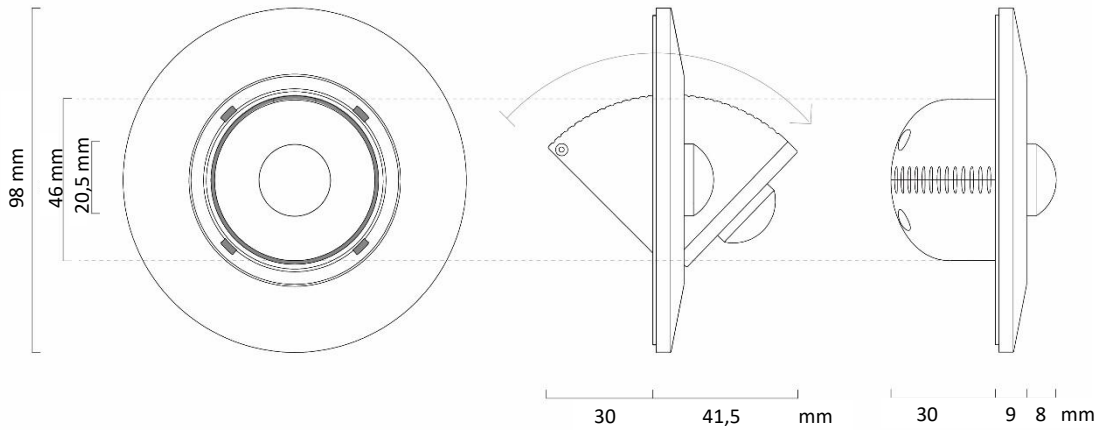
protection class	II in intended use
protection degree terminals	IP20
Protection degree housing	IP40
mounting	back box – dimensions see below surface mounted (article number extension „-AP“) – dimensions below suspended ceiling (article number extension „-ZD“) – dimensions below
available colours	RAL9016 (Black and RAL9010 on request)
DALI-2 functionality	**application controller** and instances

terminals

connection type	spring terminal connector
wire size solid core	0,5 … 1,5 mm² (AWG20 … AWG16)
wire size fine wired	0,5 … 1,5 mm² (AWG20 … AWG16)
wire size using wire end ferrule	0,25 … 1,5 mm²
stripping length	8,5 … 9,5 mm / 0,33 … 0,37 inch

standards

EMC	EN 61547 EN 55015
safety	EN 61347-2-11 EN 61347-1
markings	DALI-2, CE



dimensions and space requirements

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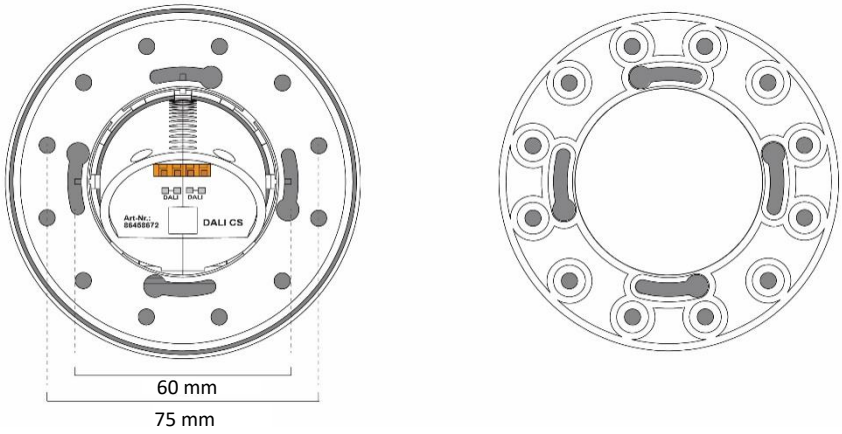
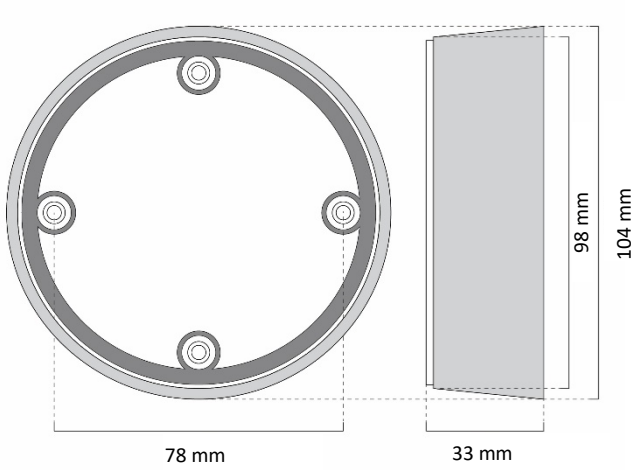
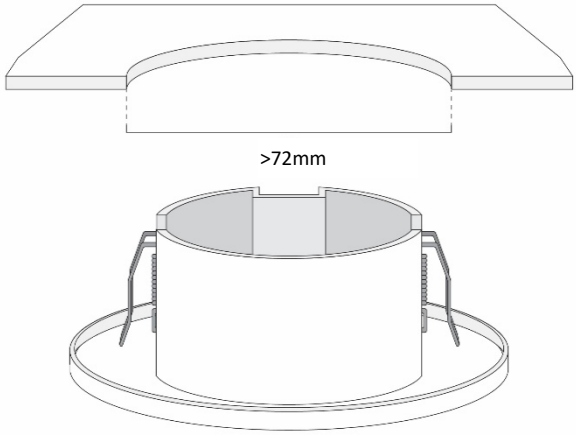


dimensions mounting ring



surface mounting
dimensions accessory
article number addition „-AP“



suspended ceiling
dimensions mounting hole diameter
article number addition „-ZD“

Specification, Characteristics - Version Luminaire installation

type	**DALI-2 CS THP-AQ Luminaire installation**
article number	86457786-AQ-LE

electrical data	
supply	via DALI signal line (DALI-voltage according IEC62386)
marking terminals	-
typical current consumption DALI	5.5 mA
power consumption	<100mW
control	DALI-2

insulation data	
impulse voltage category	II
pollution degree	2
rated insulation voltage	250V
rated impulse withstanding voltage	4kV

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insulation DALI/housing	reinforced isolation
insulation test voltage	3000Vac

environmental conditions

storing and transportation temperature	-20°C … +70°C
operational ambient temperature	-20°C … +60°C
rel. humidity, none condensing	15% … 90%

technical data

Motion Detection (62386 -303)	
principle	PIR
detection range (at >8°C temperature difference)	7m
typical mounting height	3m
detection zones	32
horizontal	±45°
vertical	±45°
min. temperature difference	>4°C
details	Figure. 3, page 8
light sensor (62386-304)	range: 0-2046lux (11bit), resolution: 1lux event: 0-2046lux(10bit), resolution: 2lux
temperature sensor (62386-103)	range: -20°C ... 80°C, resolution: 0,1°C
humidity sensor (62386-302)	range: 0% ... 100%, resolution: 0,1%
Air pressure sensor (62386-103)	range: 600hPa … 1100hPa, resolution: 1hPa
air quality sensor (62386-103)	range: 0 ... 500, resolution: 1
eCO2 sensor (CO2 equivalent) (62386-103)	range: 0ppm ... 8000ppm, resolution: 10ppm

index	air quality	index	air quality
0 - 50	Excellent	201 – 250	heavily polluted
51- 100	Good	251 -350	severely polluted
101 - 150	lightly polluted	> 351	extremely polluted
151 - 200	moderately polluted		

ppm	air quality	ppm	air quality
0 - 350	excellent	1501 -2500	heavily polluted
351- 700	good	2501-5000	severely polluted
701 - 1000	lightly polluted	5001-8000	extremely polluted
1001 – 1500	moderately polluted		

general data

protection class	II in intended use
protection degree terminals	IP20
protection degree housing	IP40
mounting	Luminaire installation – dimensions see below
available colours	black RAL9016 (article number extension “–W16“)
DALI-2 functionality	Application Controller und Instanzen

standards

EMC	EN 61547, EN 55015
safety	EN 61347-2-11, EN 61347-1
markings	DALI-2, CE

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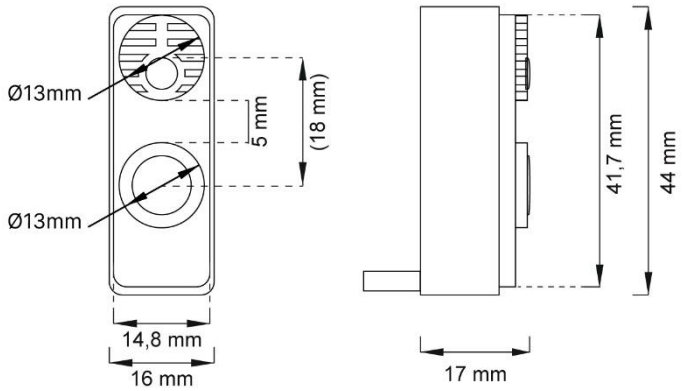
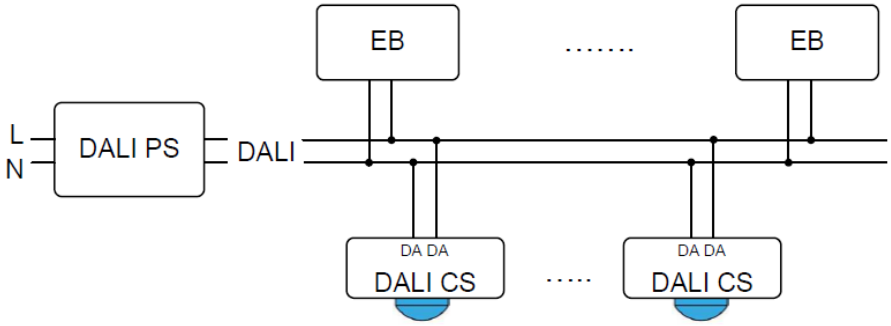


dimensions and space requirements – luminaire installation- article number extension „-LE“

Application example



typical application: several sensors on one DALI-line

Sensor types

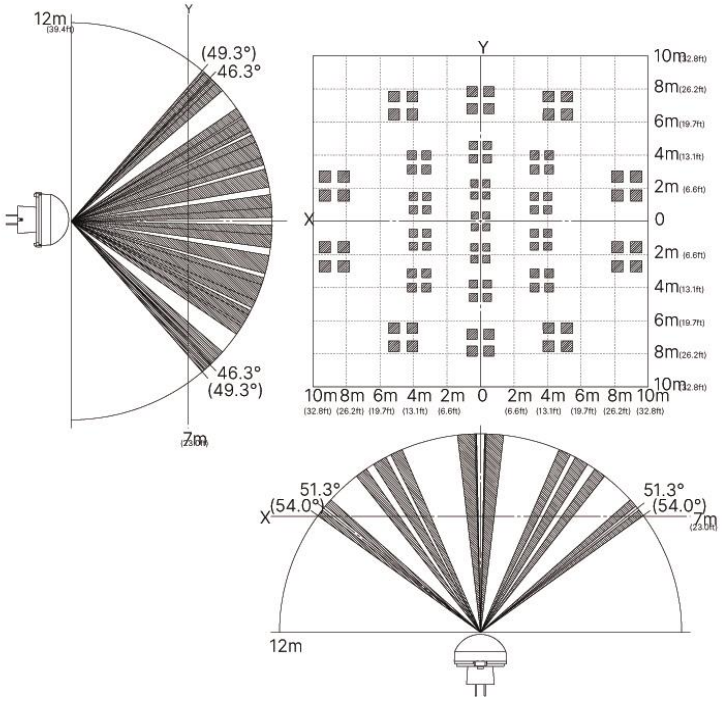


Figure. 1 ***CS: Standard*** *motion detection (Art. Nr.: 86457786 -AQ)*
Detection area: ***X-Y cross section at 7m***

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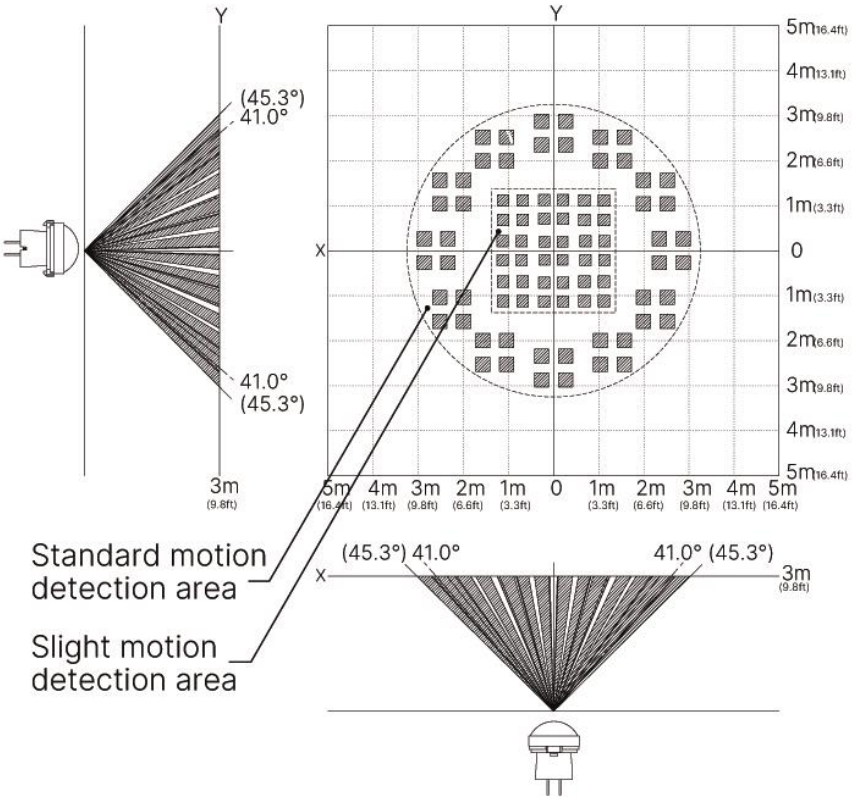

Figure. 2 ***CS-O: Office*** *motion detection (Art. Nr.: 86457786 -AQ-**O**) detection area:* ***X-Y cross section at 3m*** *- The rectangular centre zone is optimized for detecting smallest movements.*

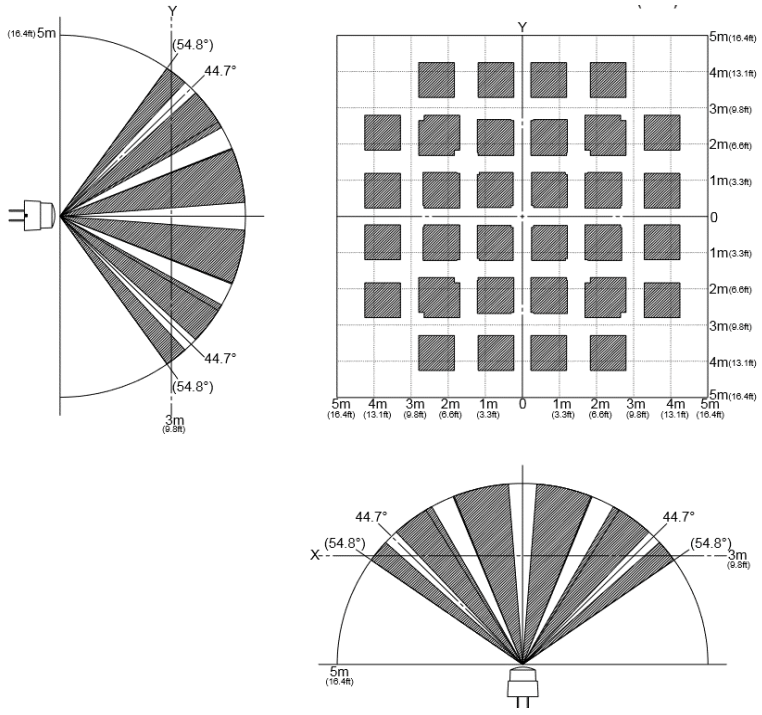

Figure. 3 ***CS-LE: luminaire installation:*** *motion detection (Art. Nr.: 86457786 -AQ-**LE**) detection area:* ***X-Y cross section at 3m.***

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Factory Setting

For simple applications the factory settings are sufficient. The device configuration can be changed via the DALI Cockpit and adapted to the current application.

DALI-2 Settings	Application Controller – Master Mode
Operating Mode	Motion detection without constant light control, an external *ON command* deactivates motion detection until the next external *OFF command*
Effective range	Broadcast
ON command (1)	Recall Max
Hold Time (2)	10min
Absence value (3)	none
Hold Time Absence (4)	0s
OFF command (5)	Off
On command threshold	none
Bright Out threshold	none
Power Up behaviour	no action
Constant light control (CLC)	inactive
threshold control temperatur	inactive
threshold control humidity	inactive
threshold control air pressure	inactive
threshold control air quality (version -AQ)	inactive
Front-LED (motion indication)	inactive
Event messages	
instance 0 - motion	inactive
instance 1 - light	inactive
instance 2 - temperature	inactive
instance 3 - humidity	inactive
instance 4 - air pressure	inactive
instance 5 - air quality	inactive
instance 6 - eCO2	inactive

Instance general settings

The following instance settings are the delivery default and are necessary in combination with a DALI-2 CS Master. In combination with a central control unit, the specifications of the central control unit need to be followed (especially with regard to the event schema).

Instance No. 0 – Motion:

Event scheme	device addressing
Event filter	Occupied Vacant
Deat time	0.00 sec
Report time	not applicable
Hold time	1 sec

Instance No. 1– light:

Event scheme	device addressing
Event filter	illuminance level
Deat time	0.8 sec
Report time	unused
Hysteresis Min	5 Lux
Hysteresis	5 %

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Instance No. 2 – Temperature
Instance No. 3 – Luftfeutchtigkeit
Instance No. 4 – Luftdruck
Instance No. 5 – Luftqualität
Instance No. 6 – eCO2:

Event scheme	instance addressing
Event filter	sensor value
Deat time	1.5 sec
Report time	unused
Hysteresis Min	2 (°C/%/hPa/)
Event messages	5 %

For general information on DALI instances see also the "DALI-2 Instance guide".

Installation

- the DALI-2 CS is directly connected and supplied by the DALI bus. A general DALI bus power supply is required.
- The connection to the DALI terminals can be made regardless of polarity.
- The terminals are suitable for wire cross-sections ranging from 0.5 mm^2 to 1.5 mm^2.
- back box mounting: installation of the mounting ring directly on the back box. The housing is then simply plugged onto to the mounting ring. The recessed head has sufficient space within the electrical installation box enabling a completely flat installation.
- The CS Module enables alignment to the desired detection area through 360 ° axial rotation and vertical inclination of up to 40°.
- For mounting the sensor on cavity walls or suspended ceilings a version including additional fixtures with spring-clips is available: article number extension “-ZD”.
- Version for surface mounting is available: article number extension “-AP”.
- Version integration in luminaires is available (Art.Nr.: 86457786 -LE, Art.Nr.: 86457786 -AQ-LE)
- The wiring should be carried out as a permanent installation in a dry and clean environment.
- Installation may only be carried out in a voltage-free state of the system and by qualified specialists.
- National regulations for setting up electrical systems must be followed.
- The DALI wiring can be realized with standard low-voltage installation material. No special cables are required.
- Only 1 wire may be connected to each terminal. When using double wire end ferrules, the connection capacity of the terminal must be considered.

☞ **Attention:** The DALI-signal is not classified as SELV circuit (Safety Extra Low Voltage). Therefore, the installation regulations for low voltage apply.

☞ **Note:** The cross section: the voltage drop on the DALI line must not exceed 2V at maximum length (300m) and maximum bus load (250mA).

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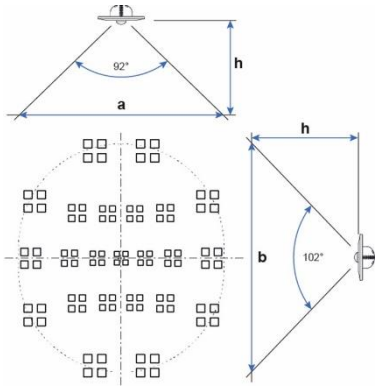
Presence Detection

For movement detection a temperature difference between the moving object and environment of at least 4°C is required. Heat sources such as copiers or heaters may have a negative influence on motion detection.

Presence Detection (Standard)

The applied PIR method allows coverage of relatively large areas using only one sensor head. With opening angles of 92° and 102° and a sensor mounted at a height of 5 meters the 92 detection zones cover an area of more than 100m^2. The distance between sensor and the object of interest should be less than 12 meters, which limits the mounting height to about 8m. See Figure. 1, page 7 and Table 1 below.



h [m]	a [m]	b [m]	A [m2]
2,50	5,2	6,2	25,1
2,7	5,6	6,7	29,3
3,0	6,2	7,4	36,2
3,5	7,2	8,6	49,2
4,0	8,3	9,9	64,3
5,0	10,4	12,3	100,4
6,0	12,4	14,8	144,6
8,0	16,6	19,8	257,1

Table 1 CS-Standard: relation of mounting height and detection area

Presence Detection CS-O

Suitable for office application where detection of slight motion is required e.g. detection of arm movement of a sitting person. The DALI CS-O is tailored to this application and has a sensitive “inner area” and a standard detection “outer area”. The maximum mounting height is about 3m. See Figure. 2, page 8.

The rectangular central zone is optimized for detection of the slightest motion. The area has an opening angle of 44 ° x 44 ° and 36 detection zones. With a mounting height of e.g. 2.2m, an area of 3.24 m^2 can be covered, see Figure. 4 and Table 2.

The outer standard motion detection zone has an opening angle of 90 ° x 90 ° and 48 detection zones. With a mounting height of e.g. 2.2m, an area of 15.2m^2 can be covered. (see Table 2).

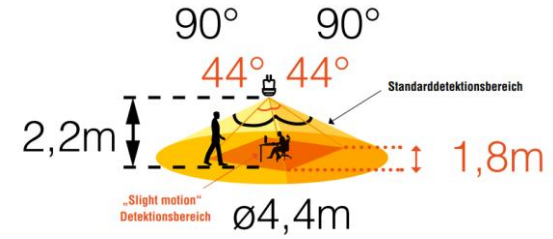


Figure. 4 CS-Office detection range

h [m]	Standard Detection area			Slight motion detection area	
	a [m]	b [m]	A1 [m²]	l [m]	A2 [m²]
2,0	4	4	12,5	1,6	2,56
2,2	4,4	4,4	15,2	1,8	3,24
2,5	5	5	19,6	2	4
3,0	6	6	28,2	2,4	5,76

Table 2 CS-Office: relation of mounting height and detection area

The recommended mounting height is 3m. The distance between the sensor and the object to detect should not be greater than 3.1m.

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Presence Detection CS-LE

Der DALI-2 CS-LE has a PIR lens with opening angles of 110°x 110° und 32 detection zones. With a typical mounting height of 3m, over 25m2 of surface can be covered, see Figure. 3 , page 8. The distance between the sensor and the object to be detected should be a maximum of 5m.

Cycle of Motion Detection

The motion detection is always processed according to the following sequence:

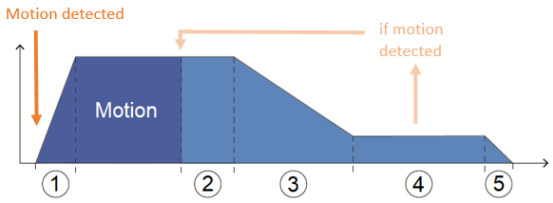

Figure. 5 motion/presence detection sequence

States:
1: 1st light level (with defined fade time)
2: Hold Time (for 1st light level)
3: 2nd light level (with defined fade time)
4: 2nd Hold Time (for 2nd light level)
5: off state (fade out)

When motion is detected the sensor switches to the configured light level **(1)**. While further motion is detected or the hold time is running **(2)** the light level stays on – either on a fix light level or controlled by a constant light control algorithm.
If no further motion was detected, the count down of the 1st hold time starts **(2)**.
After the hold time elapsed the sensor changes to the 2nd light level **(3)** for a defined time **(4).** This 2nd light level is a user defined value (no constant light control). If motion is detected in this state, the sensor switches to the first light level **(1)**. In case no further motion is detected the Off command **(5)** is sent after the 2nd hold time (**4**) elapsed.
HINT: set the “absence level” to a low value, otherwise it could be higher than the light level set by the constant light control.

Light Sensor

All DALI-2 CS versions also include a light sensor. The light sensor measures the reflected illuminance in a range from 0 to 2047 lux. The resolution is 1lux for DALI events and 2 lux for DALI queries.
The incident light is rated by the spectral sensitivity of the human eye and thus comparable to the subjective visual perception of brightness.
The incident light is accumulated over the area covered by the lens and can be interpreted as average value in the detection area. A reference to the reflecting surface below the sensor can be established with the help of a reference measurement and adjustable offset value.

Temperature

The current air temperature (°C) is measured by the sensor and can either be used for threshold control (see section “Threshold control THP-AQ”), queried using a “Query” command or can be automatically provided by the sensor using an event(see section Instance 2: Temperature). The measuring range is -20°C ... 80°C. with a resolution of 0.1°C.

Humidity

The current relative humidity (%) is measured by the sensor and can either be used for threshold control (see section “Threshold control THP-AQ”), queried using a “Query” command or can be automatically provided by the sensor using an event (see section Instance 3: Humidity). The measuring range is 0% … 100% with a resolution of 0.1%.

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Air pressure

The current air pressure (hPa) is measured by the sensor and can either be used for threshold control (see section “Threshold control THP-AQ”), queried using a “Query” command or can be automatically provided by the sensor using an event(see section Instance 4: air pressure). The measuring range is 600hPa ... 1100hPa with a resolution of 1hPa.

Air quality

The sensor measures the air quality based on the proportion of existing air pollution. The air quality is shown as an index, ranging from 0 ... 500. The following Table 3 describes the relationship between the index and air quality:

Table 3 Air quality index

Index	Air quality
0 - 50	Excellent
51 - 100	Good
101 - 150	Lightly polluted
151 - 200	Moderately polluted
201 - 250	Heavily polluted
251 - 350	Severely polluted
>351	Extremely polluted

Table 5 describes the possible impact and suggested counter measures in case of poor air quality.

The current air quality value can either be used for threshold control (see section “Threshold control THP-AQ”), queried using a “Query” command or can be automatically provided by the sensor using an event(see section Instance 5: air quality).

eCO2 – CO2 equivalent

Version: CS THP-AQ

The sensor measures the air quality based on the proportion of existing air pollution. From the measured value the CO2 equivalent can be calculated: eCO2 value, ranging from 0ppm ... 8000ppm. The following Table 4 describes the relationship between the eCO2 value and air quality

Table 4 eCO2 value

eCO2 (ppm)	air quality
0 - 350	Excellent
351 - 700	Good
701 - 1000	Lightly polluted
1001 - 1500	Moderately polluted
1501 - 2500	Heavily polluted
2501 - 5000	Severely polluted
5001 - 8000	Extremely polluted

Table 5 describes the possible impact and suggested counter measures in case of poor air quality.

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Table 5 *impact and suggested action for different air quality index*

	Index	eCO2 (ppm)	Impact (long-term exposure)	Suggested action
	0 - 50	0 - 350	Pure air; best for well-being	No measures needed
	51 - 100	351 - 700	No irritation or impact on well-being	No measures needed
	101 - 150	701 - 1000	Reduction of well-being possible	Ventilation suggested
	151 - 200	1001 - 1500	More significant irritation possible	Increase ventilation with clean air
	201 - 250	1501 - 2500	Exposition might lead to effects like headache depending on type of pollution	optimize ventilation
	251 - 350	2501 - 5000	More severe health issue possible if harmful substances are present	Contamination should be identified if level is reached even w/o presence of people; maximize ventilation & reduce attendance
	>351	5001 - 8000	Headaches, additional neurotoxic effects possible	Contamination needs to be identified; avoid presence in room and maximize ventilation

Functionality

It is necessary to distinguish between application controller and DALI-2 instances.

The **application controller** gives direct DALI control commands that are immediately executed by the DALI drivers.

DALI-2 instances generate event messages that are interpreted and processed by higher-level control units with DALI connection (e.g. DALI-2 CS in Master Mode, WAGO, Beckhoff, LUNATONE DALI-2 KNX gateway). General information on the DALI-2 instance mode: DALI-2_Instance-Guide
Configuration of instances is described in section: “Instances: General“ on page 26.

The **DALI-2 CS THP (AQ)** can be used as either an application controller: *Master Mode*, or in instance mode: *Slave Mode*. For the application controller all operating modes and setting options described in the document are available.
A version of the DALI-2 CS THP (AQ) without application controller is also available, see DALI-2 CS THP AQ Integration

Operating Modes

The DALI-2 CS module offers 4 different operating modes:
motion control,
motion control with constant light control,
sole constant light control
light control via light thresholds.

External commands can also be used to influence the operating behaviour of the sensor (e.g. when operated via another control device). The reaction to external commands is explained in detail for each operating mode.

Operating Mode 1 – motion control

- Movement activates a fixed light level

If movement is detected the time sequence is activated with a user defined fixed light level in State 2 (see Figure. 5 "Motion detection: sequence" on page 12). The light level stays active until no more movement is detected and the hold time has elapsed. Then the light level will be switched to the 2nd user defined light level.
Additional threshold values can be defined, such that the motion control is only active above or below this defined threshold.

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The operating behaviour can be influenced by external on / off / dimming and scene commands. The options for each command are described on page 21

Operating Mode 2 – motion control with constant light control

- Movement activates constant light control
- 2nd light level is user defined and constant

If movement is detected the time sequence is activated with constant light control in State 2 (see figure "Motion detection: sequence" on page 12). The constant light control stays active until no more movement is detected and the “Hold On Time” has expired. Then the light level will be switched to the 2nd light value, which is a fixed user defined value. Additional threshold values can be defined: such that the motion and light control is only active above or below this defined threshold. The operating behaviour can be influenced by external on / off / dimming and scene commands. The options for each command are described on page 21

Operating Mode 3 – constant light control

- Constant light Control
- No motion detection

In this operating mode, only the light sensor is used; motion detection is inactive. The constant light control can be switched on and off with DALI commands (e.g. from a control device such as a DALI light switch).
The operating behaviour can be influenced by external on / off / dimming and scene commands. The options for each command are described on page 24.

Operating Mode 4 – light threshold control

- Light control via light thresholds
- No motion detection

Only the light sensor is used in this operating mode. Both motion detection and constant light control are inactive. 4 light thresholds can be defined which trigger a DALI command on either falling below or exceeding the threshold. 2 of the 4 thresholds can be used to send commands repeatedly. The commands are sent at a user-defined interval until the threshold condition is no longer met.
The operating behaviour can be influenced by external scene commands. The options are described on page 24.

Additional Functionality

Response to external DALI commands
The behaviour of the control in the event of external commands (e.g. by a switch) can be configured with the DALI cockpit. Depending on the operating mode, different behaviours are possible. The options are described later in the document.
The following commands sent to the same external control address are interpreted as an **ON command**:

RECALL MAX
RECALL MIN
ON AND STEP UP
DAP>0%
GOTO SCENE X (if the command was configured to be interpreted as an ON command for the CS)
GO TO LAST ACTIVE LEVEL (FW ≥ 6.0)

The following commands sent to the external control address are interpreted as an **OFF command**:

OFF
DAP=0
GOTO SCENE X (if configured to be interpreted as an OFF command for the CS)

Dimming commands: In addition, it can be specified how the motion control or light control should behave when manual dimming commands (UP/DOWN) to the external control address occurs.

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On and Bright Out threshold
The motion sensor function can be adapted to the ambient light behaviour with the help of the On- and Off-Threshold.

ON Command threshold: The motion detection sequence can be started independent from the actual light level (default) or if the light level is above or below the OnCmd-threshold.
For a running motion sequence the presence detection – retriggering the sequence on motion - can either be set independent from the actual light level or only if the light level is below the **Bright out threshold**.

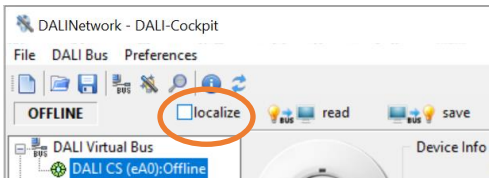
Bright out- Application example: Car Park lighting, that is set ON during the night (if measured light level < 70lux) but should not be kept ON during the day even though there might be constant detection of motion.

Power-On behaviour
It is possible to configure a start-up command to achieve a defined operating state after power on (return of the bus voltage). The start-up command can either be a DALI-command or a fast run of the motion detection sequence.

M*ultiple sens*ors controlling one area
To allow several sensors to control the same effective range (e.g. a corridor with sensors on each end), one of the sensors needs to be defined as master, while the others can be assigned to it to deliver their sensor values. In the DALI Cockpit software (tab: "Synchronisation") these sensor addresses for motion detection and sensor addresses for light detection can be specified. Backward compatibility for older generation CS is made possible by the option “Backward compatibility with eDALI CS”. Definition of the same effective range (target address 1) automatically synchronizes older generation sensors. The parameters of the sensors should be coordinated, especially the hold on times.

Configuration in the DALI Cockpit

The addressing and configuration of the DALI CS can be done easily with the help of the DALI Cockpit software tool and a suitable interface module (DALI-2 USB; DALI USB, DALI-2 WLAN, DALI-2 Display, DALI-2 IoT, DALI 4Net, DALI SCI RS232).
After an address has been assigned the parameters can be configured to fit the application.
The spatial allocation of each sensor can be done by selection of the “localize” check box in the DALI Cockpit. This will lead to flashing of the red LED of the currently selected sensor.



Configuration of the sensor is possible with the settings of the different tabs, explained in detailed on the following pages.

Tab: “General“ – Sensor Operating Mode:
Selection of the fundamental configuration is made on the “General” tab, see Figure. 6. The sensor can be set to Master or Slave Mode.
In *Master-Mode*, the DALI-2 CS takes over control according to the subsequently selected operating mode. The DALI-2 CS *Master* is an **application controller** and gives direct DALI control commands that are immediately executed by the DALI gears.
In *Slave-Mode*, the DALI-2 CS is in **instance mode** and does not send any control commands. Instead, the DALI-2 instances generate event messages that are interpreted and processed by a DALI-2 CS in *Master* mode or by higher-level DALI control unit.

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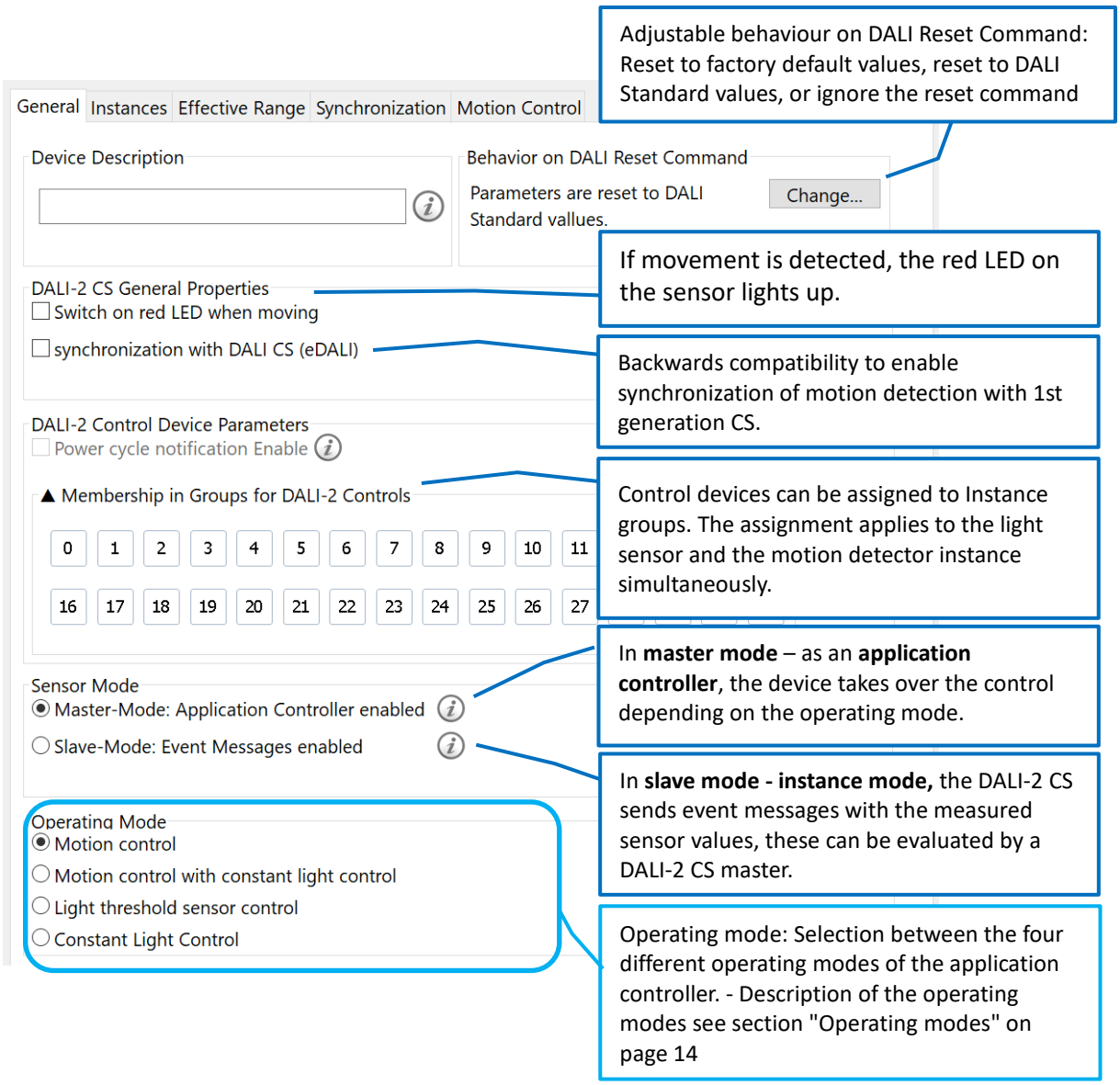

Figure. 6 Tab: "General" – sensor mode, operating mode

Tab: "Effective range" - effective range,
external control and power-up behaviour
See Figure. 7. On this tab the effective range of is defined: which DALI-gears are controlled by the CS. In addition, external control addresses can be defined, which the CS also monitors. The behaviour of the CS in case of other control units sending commands to these addresses can be defined. This way, manual control of lights via a switch can be realised, without interference of the motion detection or constant light control.

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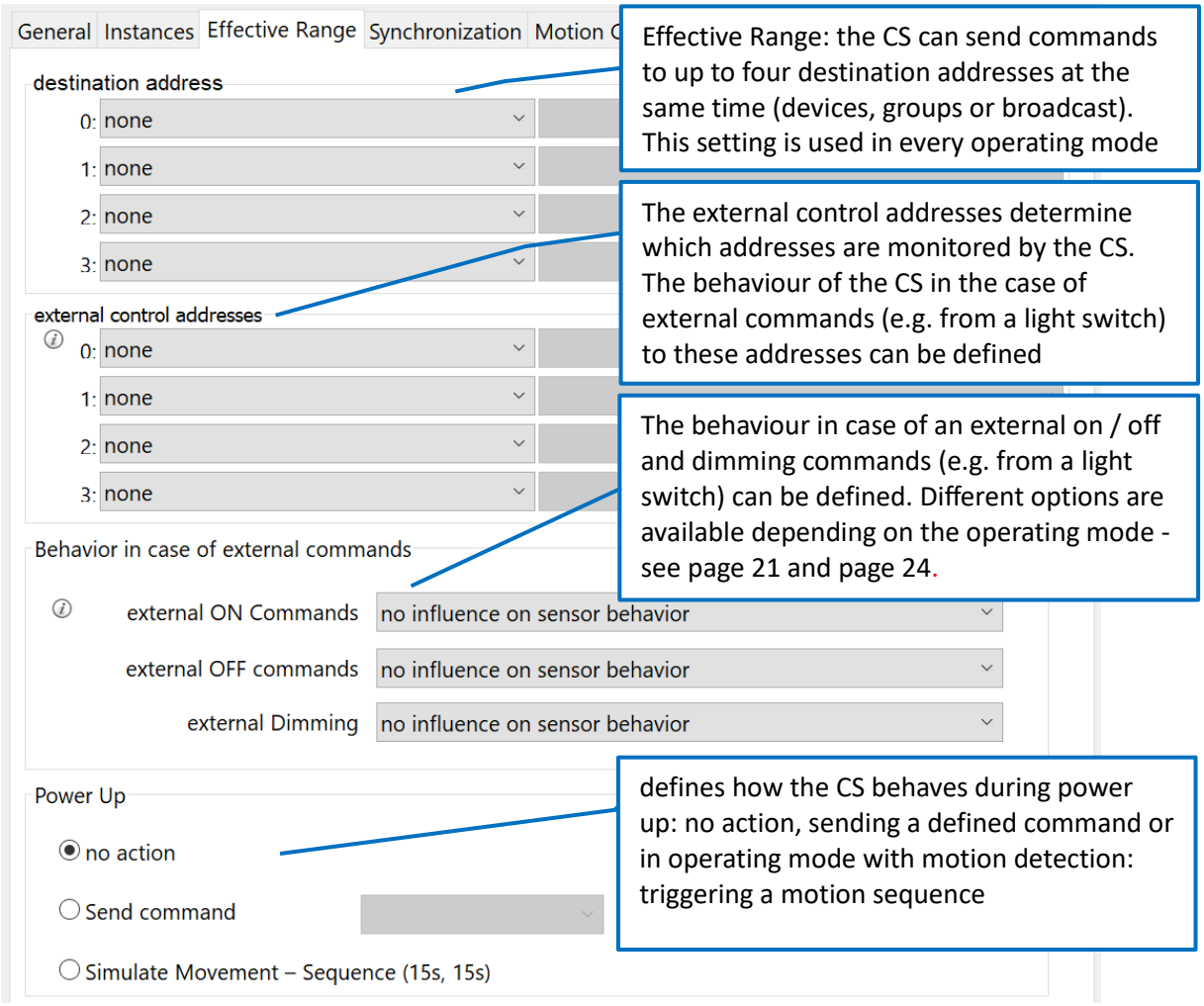

Figure. 7 Tab: "Effective Range" – destination address and external control address

Tab: "Synchronization" – sensor input

See Figure. 8. To include other sensor measurements into the evaluation, additional DALI-2 CS can be selected as sensor inputs. The selected DALI-2 CS are automatically set to slave mode by the currently configured DALI-2 CS (Master). Depending on the operating mode, different sensors input for each sensor-functionality can be defined.

for "*Motion detection*":
input for movement,
input for light thresholds
for "*Motion detection with constant light control*":
input for movement,
input for light thresholds,
input for constant light control
for "*Constant light control*":
input for constant light control
for "*Light control*":
input for light thresholds.

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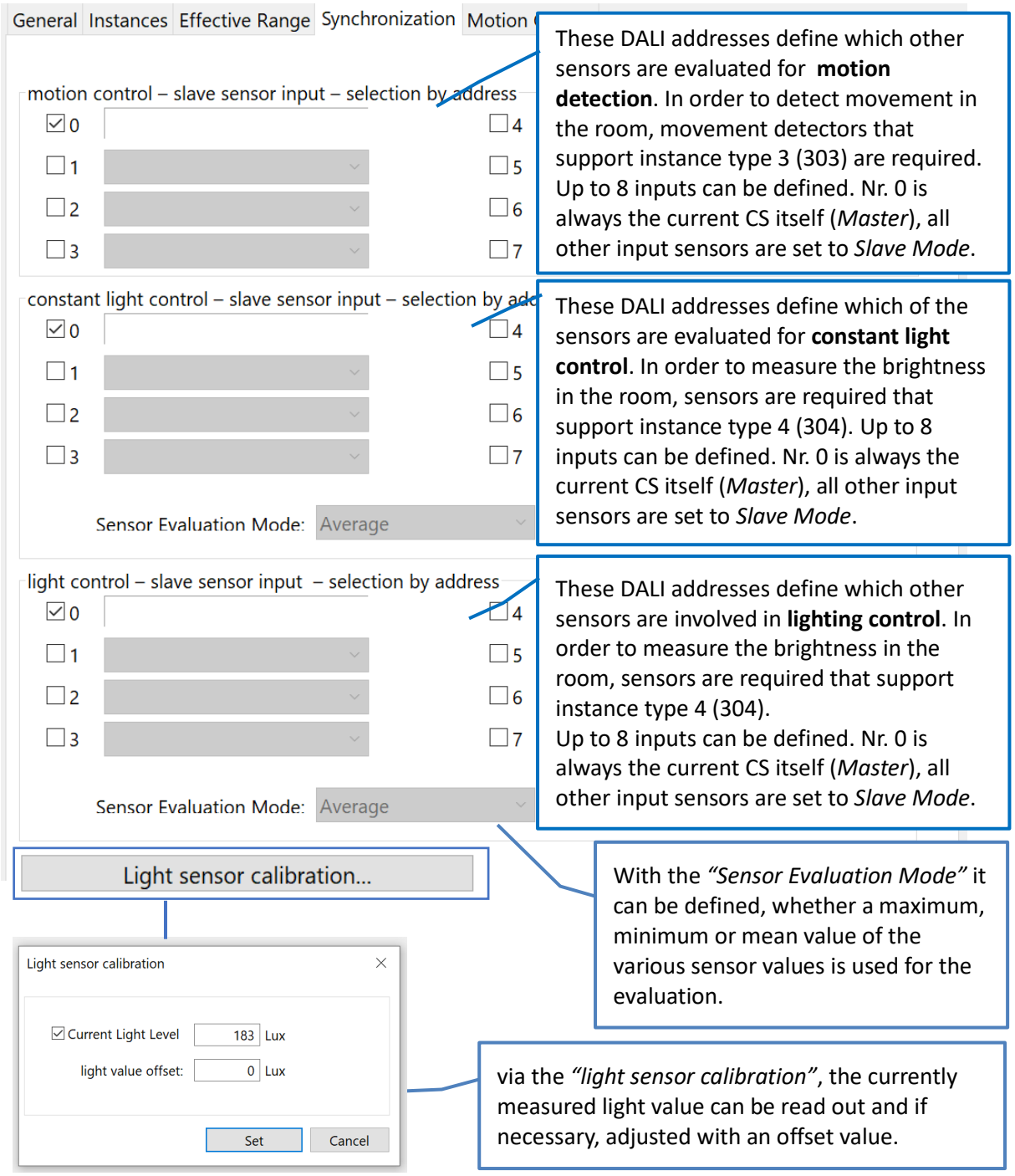

Figure. 8 Tab: "Synchronization" – sensor inputs for measurement evaluation

Tab: "Motion Control"

See Figure. 9, in this tab, the times and light levels of the motion detection sequence, that is triggered by movement, can be defined. As well as the light thresholds to activate the motion detection depending on the lighting conditions. (operating mode description see page 14 and page 15)

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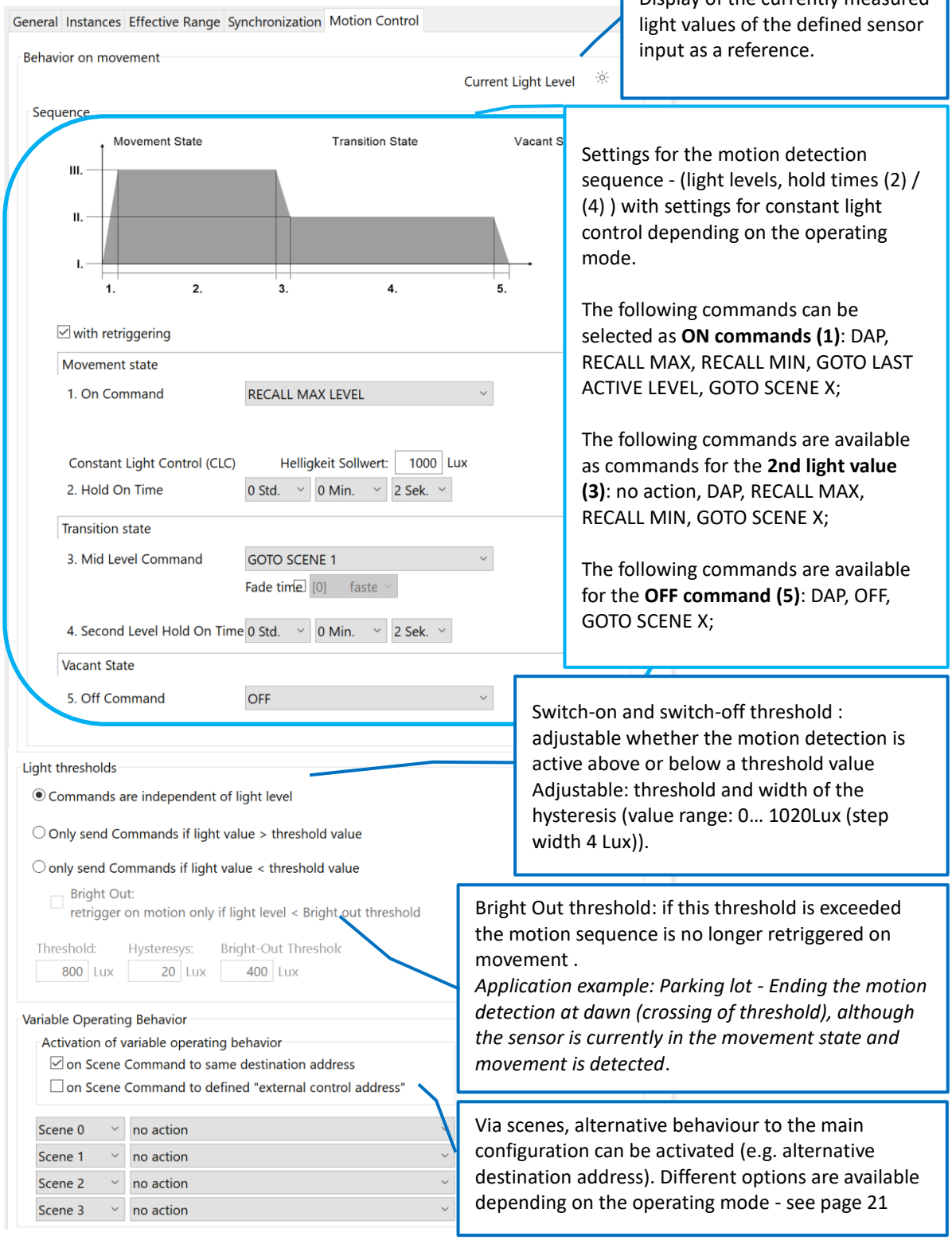

Display of the currently measured light values of the defined sensor input as a reference.

Settings for the motion detection sequence - (light levels, hold times (2) / (4)) with settings for constant light control depending on the operating mode.

The following commands can be selected as **ON commands (1)**: DAP, RECALL MAX, RECALL MIN, GOTO LAST ACTIVE LEVEL, GOTO SCENE X;

The following commands are available as commands for the **2nd light value (3)**: no action, DAP, RECALL MAX, RECALL MIN, GOTO SCENE X;

The following commands are available for the **OFF command (5)**: DAP, OFF, GOTO SCENE X;

Switch-on and switch-off threshold : adjustable whether the motion detection is active above or below a threshold value Adjustable: threshold and width of the hysteresis (value range: 0… 1020Lux (step width 4 Lux)).

Bright Out threshold: if this threshold is exceeded the motion sequence is no longer retriggered on movement .
Application example: Parking lot - Ending the motion detection at dawn (crossing of threshold), although the sensor is currently in the movement state and movement is detected.

Via scenes, alternative behaviour to the main configuration can be activated (e.g. alternative destination address). Different options are available depending on the operating mode - see page 21

Figure. 9 Tab: „motion detection control“

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Motion Control - Behaviour with external commands

The operating behaviour can be influenced by external commands (e.g. from a DALI-switch).

In the Cockpit tab "Effective range", the behaviour of the sensor on ON- / OFF- and dimming commands, sent to the 4 configurable "external control addresses", can be defined.

Additionally, the operating behaviour of the sensor can be changed with scene commands, via the tab "Motion detection" -section: Variable Operating Behaviour.

The following settings are available:

Operating mode 1 – motion detection

An external **ON command**
No influence: the ON command is ignored by the CS. The CS continues to carry out the control as configured
External control: motion control is deactivated (The CS does not send any DALI commands), until manually reactivated by an external OFF command.
Simulate movement: start the Motion Detection Sequence (Figure. 5, page 12)
An external **OFF command**
No influence: the OFF command is ignored by the CS. The CS continues to carry out the control as configured
Waiting for motion: change to State 5 and then to OFF state (state 7,Figure. 5), motion detection active - waiting for motion
Disable sensor control: change to state 5 and then to OFF state (state 7,Figure. 5), the motion detection is deactivated until reactivated by an ON command.
an external **DIMMING command:**
No influence: the DIMMING command is ignored by the CS. The CS continues to carry out the control as configured
External control: motion control is deactivated (The CS does not send any DALI commands), until manually reactivated by an external OFF command.
Change light level until end of sequence: the On command light level (State 2, Figure. 5) is changed by dimming. The new light level is retained for the current movement detection sequence

Variable Operating Behaviour - An external **SCENE command**
No action: the SCENE command is ignored by the CS.
Reset to Default: The CS is set to the basic configuration, all previously forced changes to the operating behaviour are terminated.
Alternative destinations: An alternative destination address (user defined) is used instead of the configured standard destination.
Alternative ON Command Light Level DAP: Instead of the currently configured DALI light level (DAP), the alternative defined light level DAP value is used in state 2 (Motion Detection Sequence Figure. 5).
Alternative ON Command SCENE: Instead of the currently configured scene command, the alternative defined scene is used in state 2 (Motion Detection Sequence Figure. 5).
Waiting for motion: go to State 5 and then to OFF state (state 7,Figure. 5),. motion detection active - waiting for motion

Operating Mode 2 – motion detection with constant light control

An external **ON command**
No Influence: the ON command is ignored by the CS. The CS continues to carry out the control as configured
External control: Constant light control and motion control are deactivated (The CS does not send any DALI commands). until they are reactivated by an external OFF command.
Simulate movement: start the Motion Detection Sequence (Figure. 5, page 12)
Simulate movement without constant light control: Starts the motion detection sequence (State 1, Figure. 5) and deactivates the constant light control. The sent ON command is executed instead of constant light control. The constant light control is temporarily deactivated until the OFF-state (state 7,Figure. 5) is reached.

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Constant Light Control: The motion detection is deactivated and constant light control is permanently active until it is cancelled by an OFF command. (Standard behaviour is thereby reactivated)
An **external OFF command**
No Influence: the OFF command is ignored by the CS. The CS continues to carry out the control as configured
Waiting for motion: Got to OFF state - go to State 5 and then to OFF state (state 7,Figure. 5), motion detection active - waiting for motion
Disable sensor control: change to state 5 and then to OFF state (state 7,Figure. 5) , the motion detection is deactivated until reactivated by an ON command. Enables: *„Off Only ": if the CS should only send an off command after a manual on (simulate movement) after the hold time has expired*
an **external DIMMING command:**
no influence: the DIMMING command is ignored by the CS. The CS continues to carry out the control as configured
External control: Constant light control and motion control are deactivated (the CS does not send any DALI commands) until they are reactivated by an OFF command.
Disable constant light control until end of sequence: constant light control is deactivated temporarily during Motion Detection Sequence (State 2). Automatic reactivation of constant light control after end of sequence
Change constant light control reference light level until end of sequence: the reference light level for constant light control is changed by dimming. If no dimming process is detected for 2 seconds, the current light value is adopted as the new setpoint for the constant light control. The new setpoint is only retained for the current movement detection sequence (as long as movement is detected).
Change constant light control reference light level: the reference light level for constant light control is changed by dimming. If no dimming process is detected for 2 seconds, the current light value is adopted as the new setpoint for the constant light control.

Variable Operating Behaviour - An **external SCENE command**
No action: the SCENE command is ignored by the CS
Reset to defaults: The CS is set to the basic configuration, all previously forced changes to the operating behaviour are terminated.
Alternative destinations: An alternative destination address (user defined) is used instead of the configured standard destination.
Alternative ON Command Light Level DAP: Instead of the currently configured DALI light level (DAP), the alternative defined light level DAP value is used in state 2 (Motion Detection Sequence Figure. 5).
Alternative ON Command SCENE: Instead of the currently configured scene command, the alternative defined scene is used in state 2 (Motion Detection Sequence Figure. 5).
Alternative constant light control reference light level: Instead of the current reference value an alternative user defined light level is used
Disable Constant Light Control until end of sequence: constant light control is deactivated temporarily during Motion Detection Sequence (State 2). Automatic reactivation of constant light control once no more movement is detected.
external control: Constant light control and motion control are deactivated. The CS does not send any DALI commands.
Waiting for motion: Got to OFF state - go to State 5 and then to OFF state (State 7,Figure. 5) motion detection active - waiting for motion

Tab: „Light Control"

Depending on the selected operating mode:

Operating mode: Constant light control

See Figure. 11. The tab "light control" contains the settings for constant light control (CLC) if the Operating mode: "constant light control" was selected.

Operating mode: Light threshold control

See Figure. 10. If the Operating Mode: "Light-controlled" was selected the light sensor control functions as a threshold switch. A maximum of 4 thresholds can be defined. The defined DALI commands will be executed if the values are exceeded or fallen below of.
2 of the 4 available thresholds can also be

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used to send commands periodically. The commands are sent at a user-defined interval until the threshold condition is no longer met.

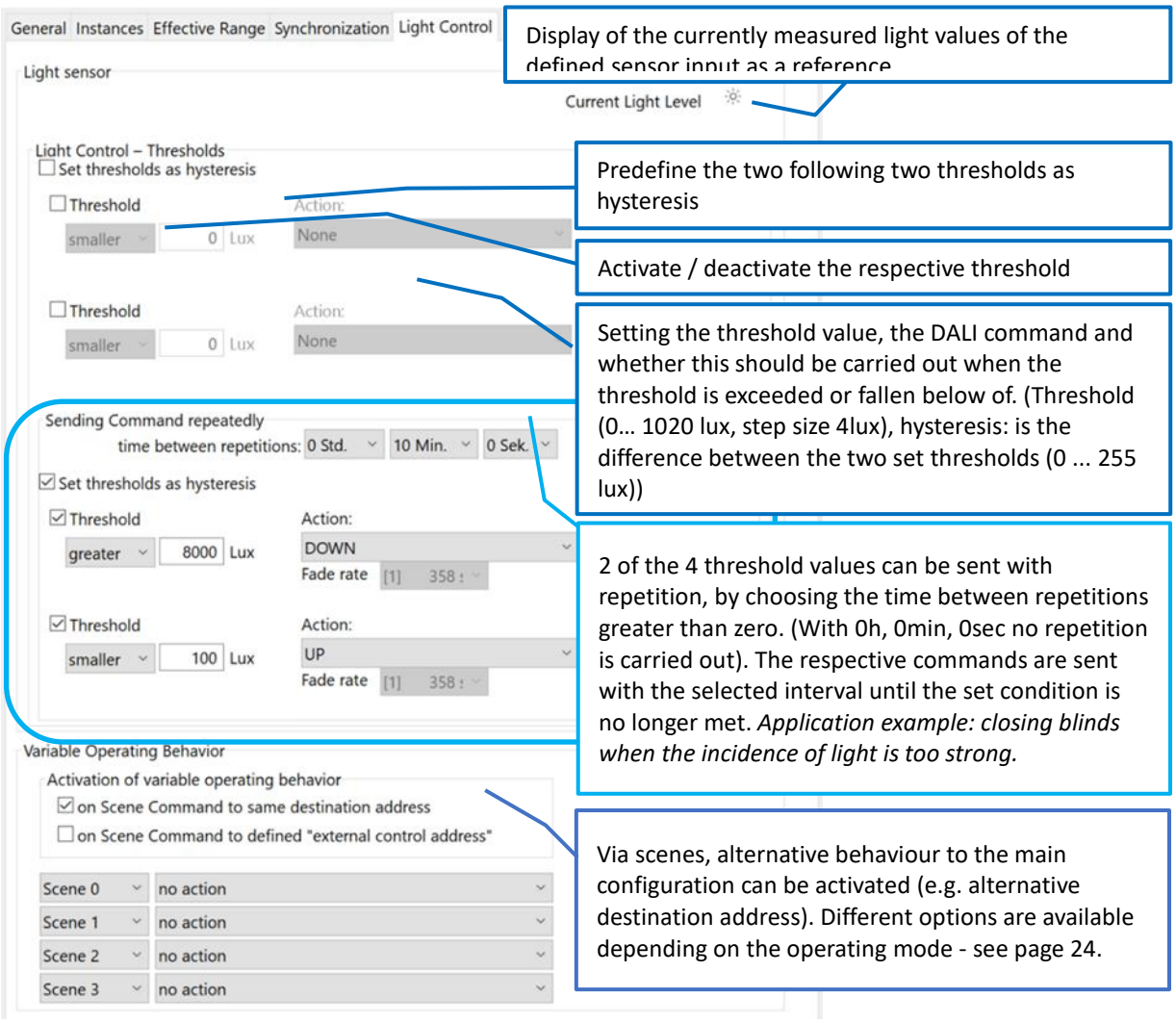

Figure. 10 Tab: „Light Control“ -Operating Mode: without constant light control

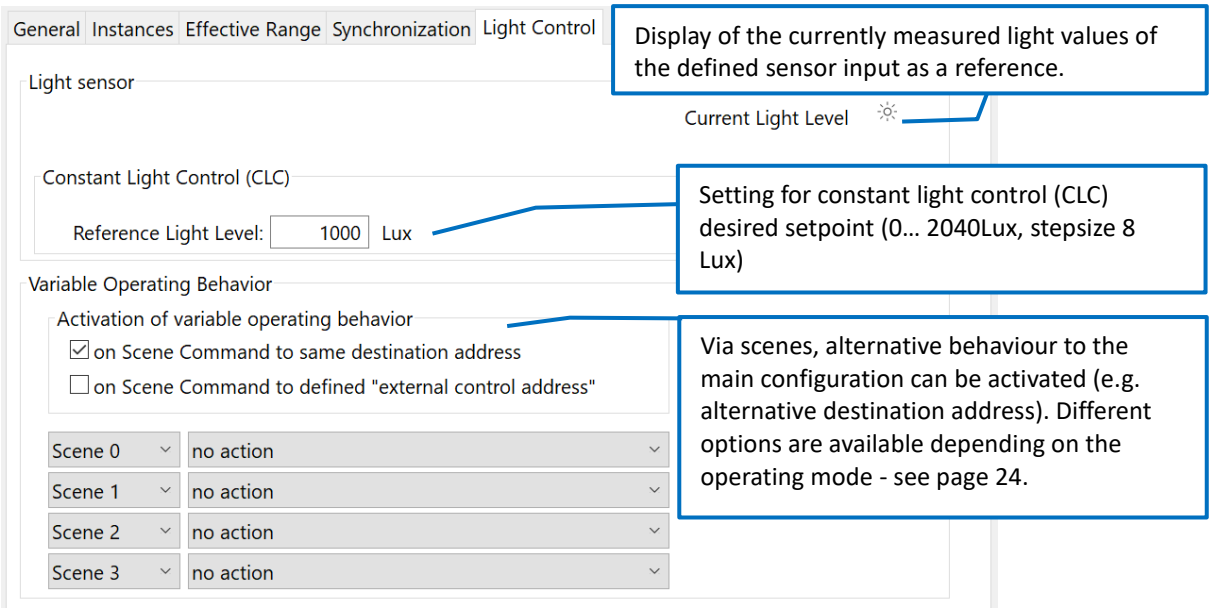

Figure. 11 Tab: „Light Control“ – Operating Mode : with constant light control

Light Control - Behaviour with external commands

The operating behaviour can be influenced by external commands (e.g. from a DALI-switch).
In the Cockpit tab "Effective range", the behaviour of the sensor on ON- / OFF- and dimming commands, sent to the 4 configurable "external control addresses", can be defined.
Additionally, the operating behaviour of the sensor can be changed with scene commands, via the tab "Motion detection" -section: Variable Operating Behaviour.
The following settings are available:

Operating Mode 3 – constant light control

An **external ON command**
No influence: the ON command is ignored by the CS. The CS continues to carry out the control as configured
External control: the constant light control is deactivated. (the CS does not send any DALI commands), until reactivated by an external OFF command.
Enable constant light control: The constant light control is activated.
An **external OFF command**
No influence: the OFF command is ignored by the CS. . The CS continues to carry out the control as configured
Disable constant light control: The constant light control is deactivated.
an **external DIMMING command:**
No influence: the DIMMING command is ignored by the CS. The CS continues to carry out the control as configured
Disable constant light control temporarily: constant light control is deactivated until the next OFF command.
Change constant light control reference light - temporary: the reference light level for constant light control is changed by dimming. If no further dimming process is detected for 2 seconds, the current light value is adopted as the new setpoint for the constant light control. The new setpoint is only retained until the next OFF command.
Change constant light control reference light level -general: the reference light level for constant light control is changed by dimming. If no dimming process is detected for 2 seconds, the current light value is adopted as the new setpoint for the constant light control.

Variable Operating Behaviour - An **external SCENE command**
No action: the SCENE command is ignored by the CS
Reset to Default: The CS is set to the basic configuration, all previously forced changes to the operating behaviour are terminated.
Alternative destinations: An alternative destination address (user defined) is used instead of the configured standard destination.
Alternative constant light control reference light level: Instead of the current reference value an alternative user defined light level is used
Enable constant light control: The constant light control is activated.
External Control: The constant light control is deactivated (the CS does not send any DALI commands).

Operating Mode 4 – light threshold control

Variable Operating Behaviour - An **external SCENE command**
No action: the SCENE command is ignored by the CS
Reset to Defaults: The CS is set to the basic configuration, all previously forced changes to the operating behaviour are terminated.
Alternative Destinations: An alternative destination address (user defined) is used instead of the configured standard destination.
External control: the light threshold control is deactivated (the CS does not send any DALI commands).

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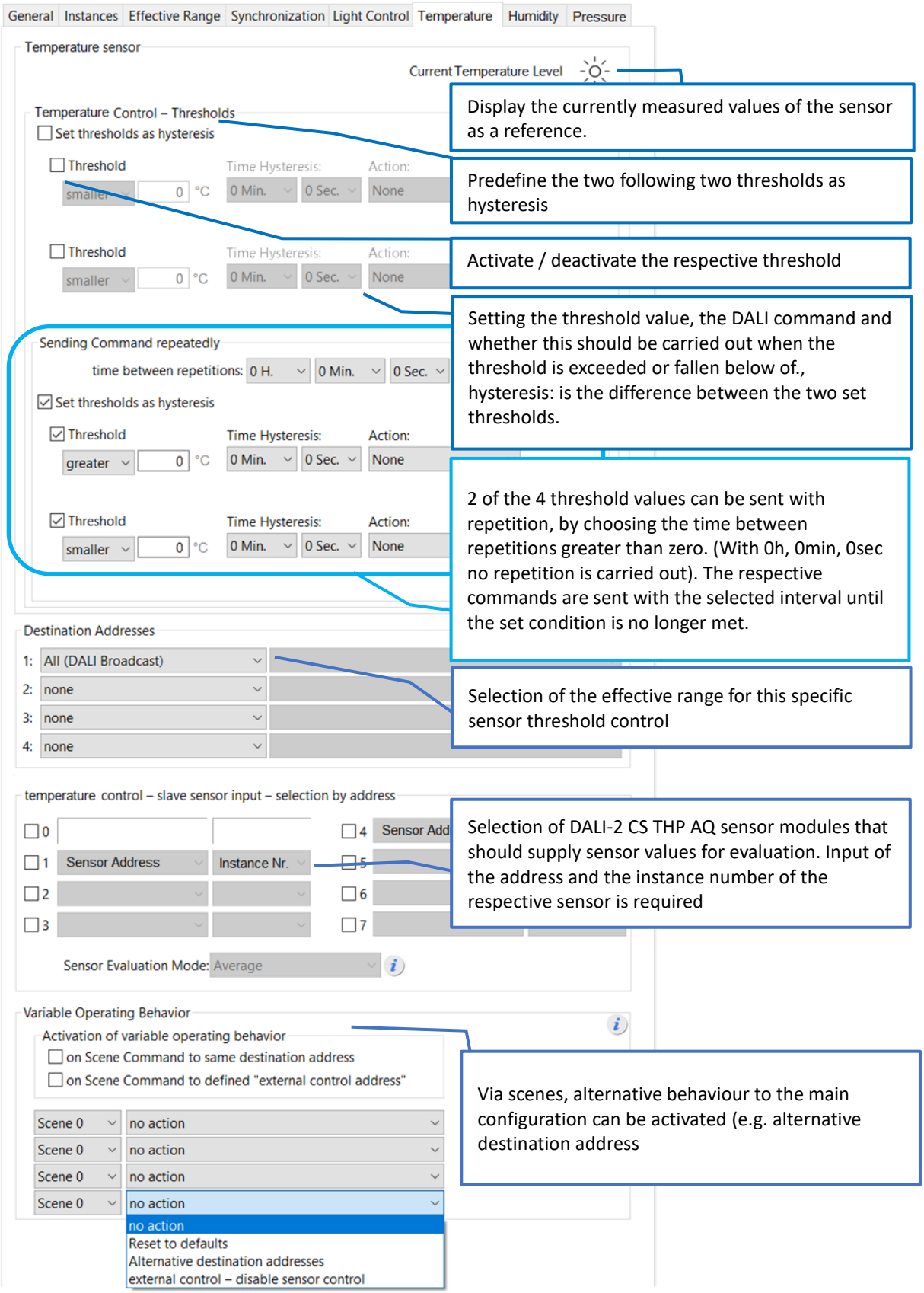

Figure. 12 Tab: „Temperature“

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Threshold control THP-AQ

For the sensor values temperature (T), humidity (H), air pressure (P) and air quality (Q), threshold values can be set in the respective tabs, regardless of the selected operating mode. See also Figure. 12, the temperature sensor is shown for reference, other sensor values allow equal configuration.

If the measured values exceeds or falls below the threshold, the selected DALI commands are sent to the effective range. A maximum of 4 thresholds can be set, 2 thresholds can be used to send commands cyclically. The commands are sent at a user-defined interval until the threshold condition is no longer met.

The effective range determines which addresses the threshold control is directed to. Additional sensors can be used as input for the threshold control; for this, the address of the additional sensor and the instance number must be specified.

Instances: General

Each instance can be configured individually. Some settings have the same functionality for all sensor instances and are therefore described in this section. Instance specific settings are explained for each individual instances in the following respective sections.

enable/disable
If instance event messages are not required, they can be deactivated. In this case, event messages are not sent, and the measured values are not updated. The instances can, however, still be queried via a “Query” command, and the DALI-2 configuration commands and queries are still supported.

Instance group
Up to three instance groups can be assigned for each instance. Only the "Primary Group" is used for the event.

Instance type
The instance type defines which DALI-2 standard is valid for this instance. (The different instance types are specified in the DALI-2 standard.)

Instance number
Each instance in a device has a unique instance number.

Device group
The device can be assigned to up to 32 device groups (0...31). The lowest device group is used for the event.

Device address
A device address (or short address) (0..63) can be assigned to each device. With this the device can be clearly addressed. (Identical short addresses should be avoided.)

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Event Scheme
The event scheme determines which information is transferred with the event. This information is required, to enable recognition and / filtering of events on the bus. The following 5 options are available:

- Instance addressing:
  instance type and instance number
- Device Addressing:
  device address and instance type
- Device/Instance Addressing:
  device address and instance number
- Device Group Addressing:
  Device group and instance type
- Instance Group Addressing:
  Instance group and instance type

Event priority
The event priority determines the order in which events are sent when they occur simultaneously on the bus. Priority 2 = highest and 5 = lowest.

Dead Time
The dead time can be set for each instance. It determines the time that must pass before an event can be sent again. This also applies if the event information (measured value) changes. If no dead time is required, it can be deactivated.

Report Time
If the event information does not change, the event is sent cyclically with the report time. The report time can be set for each instance. It determines the maximum time between a sent event and resending.

Hysteresis
Not every change in value leads to an event being generated. The hysteresis can be used to set which percentage change is necessary to trigger a new transmission. Attention, the hysteresis band is not arranged symmetrically. The following applies:

Increasing value:
The condition for an event is only fulfilled if the next value falls below the previous value minus the hysteresis or if the next value is greater than the previous value.
Decreasing value:
the condition for an event is only fulfilled if the next value exceeds the previous value plus the hysteresis or the next value is smaller than the previous value.

Hysteresis Min
Is the minimal hysteresis value that cannot be fallen below of.

Instance 0: Motion

Is an instance standardized by DALI-2 for motion detection (62386-303). All settings are implemented according to the standard. The instance is DALI-2 certified.

The sensor switches between the following states:

- People in the room and movement (0xFF)
- People in the room and no movement (0xAA)
- Empty room (0x00)

If the sensor detects movement, it immediately changes to the state: "people in the room and movement". This state is exited after 1 second at the earliest if no further movement is detected. In this case it changes to the state “People in the room and no movement”. After the hold time has expired it changes to the state “Empty room”.

Hold Time: Is the time that must pass before the state “people in the room and no movement” is changed to the state “empty room”. If movement is detected during this time the state is changed back to: “People in the room and movement”.

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Query: The current sensor state can be queried using the DALI command “Query input value”. The following values are possible: 0x00, 0xAA, 0xFF
(see paragraph above for the possible states)

Event: the sensor status is transmitted by events. The following event information is available:
Bit0 = 0: No Movement
Bit0 = 1: Movement
Bit2/Bit1 = 00: Vacant
Bit2/Bit1 = 10: Still Vacant
Bit2/Bit1 = 01: Occupied
Bit2/Bit1 = 11: Still Occupied
Bit3 = 1: Movement Sensor
Bit5..Bit9 = 0: unused
More details can be found in the standard 62386-303.

Event filter: The event filter defines for which status change an event is generated.
Filter arrangement:
Bit0: Occupied Event active
Bit1: Vacant Event active
Bit2: Still Vacant/Occupied Event active
Bit3: Movement Event active
Bit4: No Movement Event active
Bit5..Bit7: unused

Example events during the movement sequence:
1: Movement detected:
Event filter "Movement", event filter "Occupied":
→ Event data: 0x0B
2: Continued movement: with set report time, event filter "Still Occupied/Vacant": → Event data: 0x0F
3: Movement stops: event filter "No Movement":
→Event data: 0x0A
4. Expiry of set hold time:
Event filter "Vacant":→ Event data: 0x08
5. Still no movement: with set report time: event filter "Still Occupied/Vacant"
→ Event data 0x0C

Instance 1: Light intensity

is an instance standardized by DALI-2 (62386-304). All settings are implemented according to the standard. The instance is DALI-2 certified.
The current light value (lux) is measured by the sensor and can either be queried using a “Query” command or can be automatically provided by the sensor using an event.
The measuring range is 0Lux ... 2046Lux. The resolution differs between queries and generated events. A query supports a resolution of 1Lux (11Bit) and an event a resolution of 2Lux (10Bit). This means that the values obtained from an event must be multiplied by 2 to determine the light level in lux.

Query: the light level can be queried using the commands "Query input value" and "Query Input value latch". 11 bits are taken from the returned data, which correspond to the light level in lux:
Query Input Value → answer: 0x6C
Query Input Value Latch → answer: 0x9B

0x6C = **0110 1100**
0x9B = **100**1 1011
→ **0110 1100 100** = 868 Lux

Hysteresis: see chapter "*Instances General” – “Hysteresis”* page 27.

Hysteresis Min: set in lux. For general information see chapter "*Instances General*" - “*Hysteresis Min”* page 27.

Event Filter: if the filter is deactivated, no events will be sent.

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Instance 2: Temperature

is an instance standardized by DALI-2 (62386-103), instance type 0, generic. All settings are implemented according to the standard. The instance is DALI-2 certified.
The current air temperature (°C) is measured by the sensor and can either be queried using a “Query” command or can be automatically provided by the sensor using an event. The measuring range is -20°C ... 80°C. The resolution for both query and event is 0.1°C (10Bit). The value 0dec corresponds to -20°C and the value 1000dec corresponds to 80°C.

Query: see example page 31

Hysteresis: see chapter "*Instances General”* – “*Hysteresis”* page 27.

Hysteresis Min: set in °C. For general information see chapter "*Instances General*" - “*Hysteresis Min”* page 27.

Event Filter: if the filter is deactivated, no events will be sent.

Instance 3: Humidity

is an instance standardized by DALI-2 (62386-103), instance type 0, generic. All settings are implemented according to the standard. The instance is DALI-2 certified.
The current relative humidity (%) is measured by the sensor and can either be queried using a “Query” command or can be automatically provided by the sensor using an event. The measuring range is 0% ... 100%. The resolution for both query and event is 0.1% (10Bit). The value 0dec corresponds to 0% and the value 1000dec corresponds to 100%

Query: see example page 31

Hysteresis: see chapter "*Instances General”* – “*Hysteresis”* page 27.

Hysteresis Min: set in %. For general information see chapter "*Instances General*" - “*Hysteresis Min”* page 27.

Event Filter: if the filter is deactivated, no events will be sent.

Instance 4: air pressure

is an instance standardized by DALI-2 (62386-103), instance type 0, generic. All settings are implemented according to the standard. The instance is DALI-2 certified.
The current air pressure (hPa) is measured by the sensor and can either be queried using a “Query” command or can be automatically provided by the sensor using an event. The measuring range is 600hPa ... 1100hPa. The resolution for both query and event is 1hPa (10Bit). The value 0dec corresponds to 600hPa and the value 800dec corresponds to 1100hPa.

Query: see example page 31

Hysteresis: see chapter "*Instances General”* – “*Hysteresis”* page 27.

Hysteresis Min: set in hPa. For general information see chapter "*Instances General*" - “*Hysteresis Min”* page 27.

Event Filter: if the filter is deactivated, no events will be sent.

Instance 5: air quality

For Version: CS THP-AQ

is an instance standardized by DALI-2 (62386-103), instance type 0, generic. All settings are implemented according to the standard. The instance is DALI-2 certified.
The sensor measures the air quality based on the proportion of existing air pollution. The air

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quality is shown as an index, ranging from 0 ... 500. Table 3 on page 13 describes the relationship between the index and air quality. Table 5 on page 14 describes the possible impact and suggested counter measures in case of poor air quality.

Query: see example page 31

Hysteresis: see chapter "*Instances General"* – "*Hysteresis"* page 27.

Hysteresis Min: set as index. For general information see chapter "*Instances General*" - "*Hysteresis Min"* page 27.

Event Filter: if the filter is deactivated, no events will be sent.

Instance 6: eCO2 – CO2 equivalent

Version: CS THP-AQ

is an instance standardized by DALI-2 (62386-103), instance type 0, generic. All settings are implemented according to the standard. The instance is DALI-2 certified.
The sensor measures the air quality based on the proportion of existing air pollution. From the measured value the CO2 equivalent can be calculated: eCO2 value, ranging from 0ppm ... 8000ppm. Table 4 on page 13 describes the relationship between the eCO2 value and air quality. Table 5 on page 14 describes the possible impact and suggested counter measures in case of poor air quality.

Query: see example page 31

Hysteresis: see chapter "*Instances General"* – "*Hysteresis"* page 27.

Hysteresis Min: set as index. For general information see chapter "*Instances General*" - "*Hysteresis Min"* page 27.

Event Filter: if the filter is deactivated, no events will be sent.

DALI Cockpit tab: „Instances“

See Figure. 13, page 31
Depending on the version up to 6 instances are available:

DALI-2 CS THP:

- Instance 0, motion detection
- Instance 1, light intensity
- Instance 2, temperature
- Instance 3, humidity
- Instance 4, air pressure

DALI-2 CS THP-AQ

- Instance 0, motion detection
- Instance 1, light intensity
- Instance 2, temperature
- Instance 3, humidity
- Instance 4, air pressure
- Instance 5, air quality
- Instance 6, eCO2

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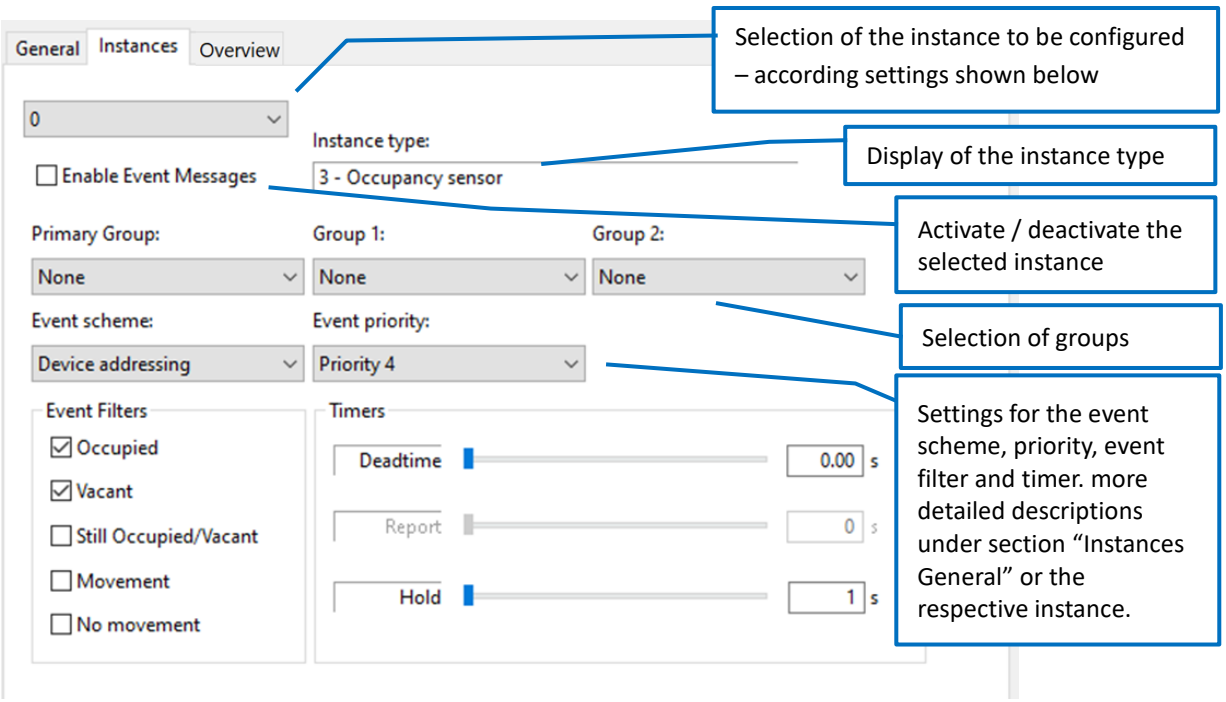

Figure. 13 Cockpit tab Instances - settings for each instance

Example Query Sensor Values – generic Instances

Table 6 Summary of the returned info by generic sensor instances for value calculation

	Temperature		Humidity		Pressure		AirQuality		eCO2	
	hex	**dez**	**hex**	**dez**	**hex**	**dez**	**hex**	**dez**	**hex**	**dez**
Value Multiplicator	01	1	01	1	01	1	01	1	08	8
Value Divisor	0A	10	0A	10	02	2	01	1	01	1
Offset	62E3	25315	0000	0	0258	600	0000	0	0000	0
Offset Multiplicator	01	1	01	1	01	1	01	1	01	1
Offset Divisor	64	100	01	1	01	1	01	1	01	1
Unit	00	0 (=Kelvin)	0C	12 (=%)	0F	15 (=hPa)	10	16 (=1)	01	1 (=ppm)
Resolution	10bit		10bit		10bit		9bit		10bit	

$$Value[unit] = Input\,Value \cdot \frac{ValueMultiplicator}{ValueDivisor} + Offset \cdot \frac{OffsetMultiplicator}{OffsetDivisor}$$

The following examples show the evaluation of sensor values of the generic Lunatone instances based on the temperature instance. The same procedure also applies to air pressure, air quality, CO2 equivalent and humidity. For a technical description of all supported commands of the generic Lunatone instances see the detailed documentation "Sensor Instance Manual".

Query and evaluation of e.g. Temperature value:

The temperature value is made up of the input value and the input value latch. The number of relevant bits is specified via the resolution:

Query Resolution → answer: 0x0A
0x0A [hex] = 10 [dec]: the information is contained in 10 bits:

Query Input Value → answer: 0x6C
Query Input Value Latch → answer: 0x9B

0x6C = **0110 1100**
0x9B = **10**01 1011
➔ 0110 1100 10 = 434 [dec]

For the DALI-2 CS THP temperature sensor the resolution is 0.1°C, the value range is: -20°C to + 80°C (this information can be found in the sensor datasheet, but can also be queried from the device, see next example for more information and table 6 on page 31).

Evaluating the returned value with the input of resolution and value range:

➔ $434 * 0.1°C = 43.4°C$
➔ $43.4°C - 20°C = \mathbf{23.4}\ °C$

More details on temperature value query and evaluation

Details on Evaluation:

Information on the resolution and value range is not only available from the data sheet but can also be queried (see next section “Details on Querying):

The value is then made up as follows:

$$Value[unit] = Input\ Value \cdot \frac{ValueMultiplicator}{ValueDivisor} + Offset \cdot \frac{OffsetMultiplicator}{OffsetDivisor}$$

From the table on page 31 or the answers from the queries (see next section “Details on Querying”) these apply to the temperature instance:

	[hex]	[dec]
Value Multiplicator	0x01	1
Value Divisor	0x0A	10
Offset MSB und LSB	0x62E3	25315
Offset Multiplicator	0x01	1
Offset Divisor	0x64	100
Unit	0x00	Kelvin

Putting these values into the formula:

$$T[K] = InputValue\frac{1}{10} + 25315\frac{1}{100}$$

$$= \frac{InputValue}{10} + 253.15$$

$$= \frac{434}{10} + 253.15 = 296.55\ K$$

$$T[°C] = T[K] - 273.15 = \mathbf{23.4°C}$$

Details on Querying:

A query (24bit DALI frame) consists of:

device address*2+1	instancenr.	query command code

In this example we have a sensor with:
DALI-2 address: A0[2]
temperature instance: instancenr. 2

Query command codes:

QUERY VALUE MULTIPLICATOR	0x40
QUERY VALUE DIVISOR	0x41
QUERY OFFSET MSB	0x42
QUERY OFFSET LSB	0x43
QUERY OFFSET MULTIPLICATOR	0x44
QUERY OFFSET DIVISOR	0x45
QUERY UNIT	0x46
QUERY RESOLUTION	0x81

QUERY of e.g. Resolution

device address*2+1	instancenr.	query command code
01	02	81

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The read unit value can be assigned from the following table:

Wert	Einheit
0	Thermodynamic temperature [K]
1	CO_2-eq (CO_2 equivalent) [ppm]
12	Relative humidity [%]
15	Barometric pressure [hPa]
16	IAQ (Indoor Air Quality) [1]

These values and assignment of units are specific to Lunatone sensors

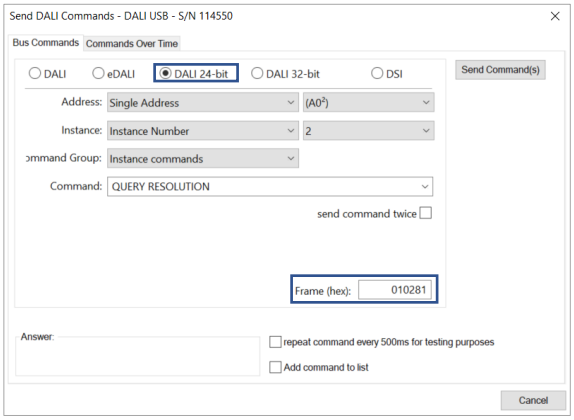
The answers to all above queries for the temperature instance are:

Type	Hex Data	Address	Command
DALI24	01 02 40	A0, iN2	QUERY VALUE MULTIPLICATOR
DALI8 Answer	01		= 1 (0x01)
DALI24	01 02 41	A0, iN2	QUERY VALUE DIVISOR
DALI8 Answer	0A		= 10 (0x0A)
DALI24	01 02 42	A0, iN2	QUERY VALUE MSB
DALI8 Answer	62		= 98 (0x62)
DALI24	01 02 43	A0, iN2	QUERY VALUE LSB
DALI8 Answer	E3		= 227 (0xE3)
DALI24	01 02 44	A0, iN2	QUERY OFFSET MULTIPLICATOR
DALI8 Answer	01		= 1 (0x01)
DALI24	01 02 45	A0, iN2	QUERY OFFSET DIVISOR
DALI8 Answer	64		= 100 (0x64)
DALI24	01 02 46	A0, iN2	QUERY UNIT
DALI8 Answer	00		= 0 (0x00)

The answers for all generic instances are listed in table 6 on page 31.

How to send queries:

Queries can be sent from the DALI Cockpit > DALI Bus > DALI Commands..:



Type	Hex Data	Address	Command
DALI24 Inst Query	01 02 81	A0, iN2	QUERY RESOLUTION
DALI8 Answer	0A		= 10 (0x0A)
DALI24 Inst Query	01 02 8C	A0, iN2	QUERY INPUT VALUE
DALI8 Answer	6C		= 108 (0x6C)
DALI24 Inst Query	01 02 8D	A0, iN2	QUERY INPUT VALUE LATCH
DALI8 Answer	9B		= 155 (0x9B)

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Purchase Order Information

Standard Version

DALI-2 CS THP-AQ

Sensor module: motion and light intensity, temperature, humidity, air pressure, air quality, eCO2,

Art.Nr. 86457786-AQ-W16: traffic white (RAL9016), back box installation

Art.Nr. 86457786-AQ-W16-AP: traffic white (RAL9016), surface mounting

Art.Nr. 86457786-AQ-W16-ZD: traffic white (RAL9016), suspended ceiling (spring)

Office Version - for office applications: detection of small movement / seated people

DALI-2 CS THP-AQ, for office applications (detection of seated persons),

Sensor module: motion and light intensity, temperature, humidity, air pressure, air quality, eCO2,

Art.Nr. 86457786-AQ-O-W16: traffic white (RAL9016), back box installation

Art.Nr. 86457786-AQ-O-W16-AP: traffic white (RAL9016), surface mounting

Art.Nr. 86457786-AQ-O-W16-ZD: traffic white (RAL9016), suspended ceiling (spring)

Luminaire installation Version

DALI-2 CS THP-AQ for installation in luminaires,

Sensor module: motion and light intensity, temperature, humidity, air pressure, air quality, eCO2

Art.Nr. 86457786-AQ-LE: black, luminaire installation

Art.Nr. 86457786-AQ-LE-W16: traffic white (RAL9016), luminaire installation

Version DALI-2 CS THP-AQ Integration

https://www.lunatone.com/en/product/dali-2-cs-integration-thp-aq/

Version DALI-2 CS– motion and light

www.lunatone.com/en/product/dali-2-cs/

Version DALI-2 CS Integration – motion and light sensor

www.lunatone.com/en/product/dali-2-cs-integration/

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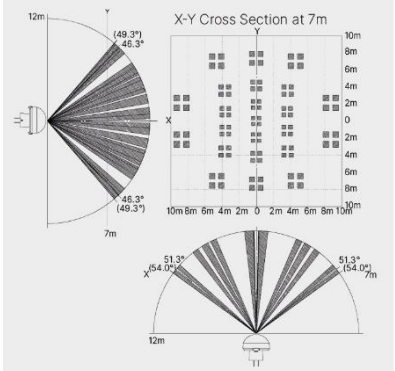
Article number system - version overview: DALI-2 CS THP AQ

LIGHT AND MOTION SENSOR (PIR) + TEMPERATURE, HUMIDITY, AIR PRESSURE & AIR QUALITY

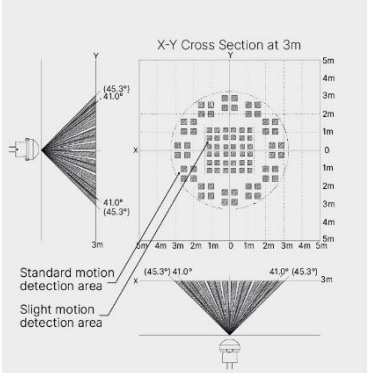
ARTICLE BASIS	SENSOR, detection range & mounting height	COLOUR	INSTALLATION TYPE
86457786-AQ –	_____ –	_____ –	_____
MEASURED VALUES temperature, humidity, air pressure & air quality	= standard, 12m & 8m O = Detection of minor movements, 2.3m / 3m & 3m On request: 15 = especially for high rooms, 15m & 12m	W16 = RAL 9016 On request: = RAL 9010 B = schwarz	= for flush-mounted installation boxes ZD = suspended ceiling type with clasp AP = surface mounting type

Lens types:

Long Distance Detection

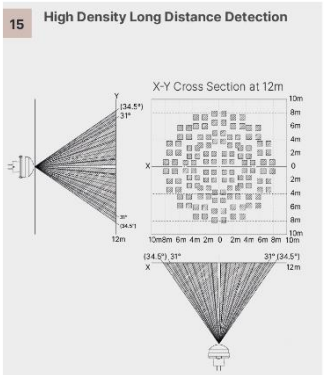


O Slight Motion Detection



On request:

15 High Density Long Distance Detection



Housing colours:

W16 RAL 9016

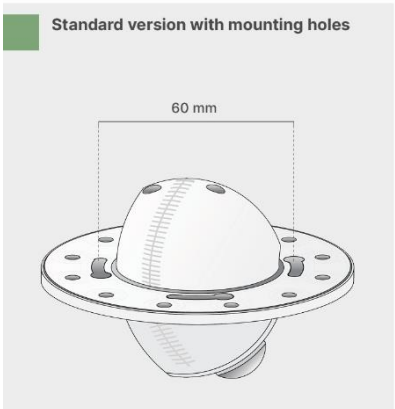
On request:

RAL 9010

B Schwarz

Installation type:

Standard version with mounting holes



ZD Version for suspended ceilings (with spring)

AP Version for surface mounting (with backbox)

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Additional Information and Equipment

DALI-Cockpit – DALI system configuration tool, free when using a Lunatone interface device
https://www.lunatone.com/en/product/dali-cockpit/

Lunatone sensor instance manual
https://www.lunatone.com/wp-content/uploads/2022/11/Lunatone_DALI-2_Sensor_Instances_EN_M0026.pdf

Instance guide
https://www.lunatone.com/wp-content/uploads/2021/10/DALI-2_Instance-Guide_EN_M0024.pdf

Lunatone DALI products
http://www.lunatone.at/en/

Lunatone datasheets and manuals
http://lunatone.at/en/downloads/

Contact

Technical Support: support@lunatone.com

Requests: sales@lunatone.com

www.lunatone.com

Disclaimer

Subject to change. Information provided without guarantee. The datasheet refers to the current delivery.

The function in installations with other devices must be tested for compatibility in advance.

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